

COMMONWEALTH OF VIRGINIA
USE OF ALTERNATIVE MODEL FOR
OPACITY VARIANCE FOR ROCKET TEST FACILITY
at
Aerojet Corporation
Orange County Facility
Culpeper, Virginia 22701
Registration No. 40743

On September 30, 2002, the State Air Pollution Control Board adopted an opacity variance (9 VAC 5 Chapter 220) for the rocket motor test operations at Atlantic Research Corporation's Orange County facility from the standard for visible emissions in 9 VAC 5-50-80. In lieu of compliance with this standard, the variance required the facility to limit total particulate matter emissions from its rocket motor test operations to 714 pounds per hour. This variance was submitted to the U.S. Environmental Protection Agency (EPA) as a revision to the Virginia state implementation plan (SIP) on January 26, 2004. Subsequently, the facility was purchased by Aerojet Corporation.

The January 2004 SIP submittal contained a technical support document that provided a basis for proposed hourly limit for particulate matter emissions from the rocket motor testing operations. Aerojet's air quality analysis included, in lieu of an EPA-approved model, the Open Burn/Open Detonation (OB/OD) dispersion model. 40 CFR 51.112(a)(2) requires that a modification or substitution of an air quality model specified in the Guideline on Air Quality Models may be allowed on a case-by-case basis if approved in writing by EPA. In addition, use of a modified or substituted model must be subject to notice and opportunity for public comment under procedures set forth in 40 CFR 51.102.

The Commonwealth therefore intends to request, in accordance with 40 CFR 51.112(a)(2), that the Open Burn/Open Detonation (OB/OD) dispersion model (version 01.3.0021) be used in the dispersion modeling protocol. The draft request for approval of the alternative model by the Regional Administrator is attached.

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COMMONWEALTH of VIRGINIA

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Mr. Donald S. Welsh
Regional Administrator
U.S. Environmental Protection Agency, Region III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

Reference: Air Quality Model,
Aerojet Corporation

Dear Mr. Walsh:

I am writing to request U.S. Environmental Protection Agency (EPA) approval of an alternative air quality model for analyzing air quality in support of a request submitted by Aerojet Corporation for a variance from Virginia's standard for visible emissions, 9 VAC 5-50-80. Aerojet proposes to use an alternative model in the dispersion modeling protocol for its facility located in Orange County, Virginia to support its request for this opacity variance for its rocket motor test operations conducted at the facility.

The protocol calls for using an alternative model instead of a preferred model according to Appendix W to 40 CFR Part 51, Guideline on Air Quality Models (GAQM). Section 3.2.2 (a) of the GAQM states, "Determination of acceptability of a model is a Regional Office responsibility. Where the Regional Administrator finds that an alternative model is more appropriate than a preferred model, that model may be used..." As a result, specific written approval by the Regional Administrator must be obtained in order to use an alternative model in a regulatory modeling application.

The alternative model requested in Aerojet's air quality analysis is the Open Burn/Open Detonation (OB/OD) dispersion model (version 01.3.0021). The U.S. Army developed this model at the Dugway Proving Grounds in Dugway, Utah. A private contractor, the H.E. Cramer Company of Sandy, Utah, was instrumental in development of the software. (The primary contact for the OB/OD model is Mr. Jay Bjorklund of the H.E. Cramer Company.)

The OB/OD model is an alternative model that had been previously promulgated in Appendix B of Appendix W, then later removed from Appendix W and placed on EPA's Support Center for Regulatory Air Models (SCRAM) website. The OB/OD model is designed for use in evaluating the potential air quality impacts of the open-air burning and detonation of obsolete munitions and solid propellants at Department of Defense (DOD) installations and similar facilities. The model can be run using either theoretical or empirical emission factors for a variety of pollutants in either gaseous or particulate form. The model predicts the downwind transport and dispersion of these pollutants using dispersion model algorithms taken from existing dispersion models. The model is capable of simulating both instantaneous (i.e., detonation) and quasi-continuous (open burning/firing) events at point/volume and/or line sources. The OB/OD model can be used to calculate peak concentration, time-mean concentration, dosage and particulate gravitational deposition from open burn and open detonation sources.

Section 3.2.2 (b) of the GAQM states, "An alternative model should be evaluated from both a theoretical and a performance perspective before it is selected for use." This section also provides three separate conditions under which such a model will normally be approved for use. The condition relevant to this request is "(2) if a statistical performance evaluation has been conducted using measured air quality and the results of that evaluation indicate the alternative model performs better for the application than a comparable model in appendix A." We understand that, in the past, EPA has interpreted this provision as requiring a site-specific comparative model evaluation study. However, we ask that you not require a site-specific study since OB/OD is the best available modeling tool for this application and there is generally no preferred model identified in the GAQM for this type of facility or operation.

Recommendations from the GAQM were followed to provide additional justification for the use of the OB/OD model as an alternative model. Section 3.2.2 (b) again provides three separate conditions under which an alternative model may normally be approved for use. The condition relevant to this request under the section is "(3) if the preferred model is less appropriate for the specific application..." Section 3.2.2 (e) then states, "...an alternative refined model may be used provided that:

- i. the model has received a scientific peer review;
- ii. the model can be demonstrated to be applicable to the problem on a theoretical basis;
- iii. the databases which are necessary to perform the analysis are available and adequate;
- iv. appropriate performance evaluations of the model have shown that the model is not biased toward underestimates; and
- v. a protocol on methods and procedures to be followed has been established."

Each of these items is discussed below:

i. the model has received a scientific peer review;

The USEPA April 21, 2000 Federal Register notice proposal to revise Appendix W to 40 CFR Part 51, included the addition of several new alternative models in the list of alternative models for the GAQM. The OB/OD dispersion model was one of those new alternative models identified in the proposal. The USEPA document entitled "Summary of Public Comments and EPA Responses, 7th Conference on Air Quality Modeling, Washington, D.C., June 28-29, 2000" contains a summary of public comments filed in response to this

notice of proposed rulemaking and the comments received at the 7th Conference on Air Quality Modeling. As indicated in an EPA response to comment, the alternative models identified in the proposed rulemaking “have been subjected to notice and public comment as part of this proposal to include in the list of alternative models.”

ii. the model can be demonstrated to be applicable to the problem on a theoretical basis;

The OB/OD dispersion model was found to be appropriate on a theoretical basis to this type of application because there is no preferred model for application to the open burning and open detonation of obsolete and unsafe munitions and propellants and the OB/OD model is specifically designed to predict the buoyant rise and dispersion of emissions from these instantaneous (open detonation) and short-term quasi-continuous (open burn) releases when a refined model is needed.

iii. the data bases which are necessary to perform the analysis are available and adequate;

The data bases used in the analysis were more than sufficient for this purpose. A set of worst-case rocket propellant emission factors (i.e., revised OB/OD model emission factors) was developed to reflect actual operations at the Aerojet facility. In addition, the data base of common propellants and explosives and their thermodynamic characteristics contained in the OB/OD model was used. Also, the meteorological data used was five years of stability array (STAR) data from Dulles International Airport. The model was run with fence-line receptors and a 10 kilometer by 10 kilometer Cartesian receptor grid with a graduated grid resolution from 100 meters to 1,000 meters.

iv. appropriate performance evaluations of the model have shown that the model is not biased toward underestimates; and

Three different evaluation studies for the OB/OD dispersion model are:

Bowers, J.F., J.E. Rafferty and J.M. White, 1990. Summary of Dugway Proving Ground Experience in Diffusion Development and Verification for MMW Obscurants. In Proceedings of Smoke/Obscurants Symposium XIII, Program Manager Smoke/Obscurants, Aberdeen Proving Ground, MD.

Bowers, J.F. and J.E. Rafferty, 1991. Additional Verification of the Dugway Proving Ground Diffusion Model for MMW Obscurants. In Proceedings of Smoke/Obscurants Symposium XV, U.S. Army Chemical Research, Development and Engineering Center, Aberdeen Proving Ground, MD.

Cramer, H.E., J.R. Bjorklund, R.K. Dumbauld, J.E. Faulkner, F.A. Record, R.N. Swanson, and A.G. Tringle, 1972. Development of Dosage Models and Concepts. Document No. DTC-TR-72-609-1, U.S. Army Dugway Proving Ground, Dugway, UT.

v. a protocol on methods and procedures to be followed has been established.

A protocol describing the modeling methods and procedures used in the air quality analysis, specifically those for the use of the OB/OD model, was submitted to DEQ for review and approval prior to conducting the analysis.

DEQ has determined that this information fulfills these criteria.

Clearly, the use of OB/OD as an alternative model for this analysis is justified for this application. We believe that OB/OD dispersion model is an appropriate model to determine the air quality impact from this facility.

If you or your staff have any specific questions relating to the technical aspect of this air modeling issue, please contact Mike Kiss at (804) 698-4460.

Sincerely,

Michael G. Dowd
Director, Air Division

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cc: Judy Katz, EPA Region III